



# **Expanding Natural Gas Use in China**

## **Status Report and Preliminary Findings On a Joint Study by SDPC and USEPA**

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**3<sup>rd</sup> Oil and Gas Industry Forum**

**Beijing, China**

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# Overview

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- **Description and Status of Study**
- **Preliminary Findings**
- **Follow-on Opportunities**

# Description of Study

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- **One of ten environmental agreements reached between SDPC and USEPA in Spring 1999**
  - ✦ Focus on broad technical, financial, and policy measures needed to expand gas use in China
  - ✦ University of Petroleum-Beijing and Pacific Northwest National Laboratory chosen to conduct study
  - ✦ Recommend policy options and further collaboration to overcome barriers

# Status

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- ★ Preliminary draft is now complete and has been circulated to small group
- ★ Workshop on 13 September to further review findings and discuss follow-on opportunities
- ★ Final report will be published in November 2001,  
See <http://www.pnl.gov/china>

# Preliminary Findings: Environment

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- Natural gas substituted for dirtier fuels can have a major impact on air quality, human health, and the environment
- Natural gas-fired power generation is cheaper than coal in many regions of China **when environmental costs are included**
- Greatest environmental benefit from fuel switching in residential and small industrial applications

# Emissions from Power Generation in China

Plant Type	SO <sub>2</sub> (g/kWh)	NO <sub>x</sub> (g/kWh)	CO <sub>2</sub> (g/kWh)	Efficiency (%)
Coal (PC)	8-20	3-5	860	37
Gas (CC)	~0	0.5-2	370	50
IGCC	0.1-1	0.5-1	790	42
Oil (CC)	1-2	2-3	540	49
Coal w/ Scrubber	1-2	1-5	880	36

IGCC = integrated gasification combined cycle; CC = combined-cycle

Source: Battelle Memorial Institute

# Environmental Impact of Substituting 60 BCM of Natural Gas for Coal

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Reductions in Thousand Tons

	<b>Gas Used</b>	<b>SO<sub>2</sub></b>	<b>Particulates</b>	<b>CO<sub>2</sub> (C)</b>
<b>Power</b>	<b>30</b>	<b>860</b>	<b>15</b>	<b>17,000</b>
<b>Industry</b>	<b>15</b>	<b>500</b>	<b>465</b>	<b>9,000</b>
<b>Residential</b>	<b>15</b>	<b>710</b>	<b>550</b>	<b>16,000</b>
<b>Total</b>	<b>60</b>	<b>2,070</b>	<b>1,020</b>	<b>43,000</b>

Source: Battelle Memorial Institute

# Preliminary Findings: Administration and Policy

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- **Positive measures have been taken**
  - ✦ Commercialization of state-owned oil majors
  - ✦ West-East pipeline project
  - ✦ Guangdong LNG terminal
- **Lack of transparency, coordination, and rule-of-law continues to slow development**
  - ✦ Gas pricing dilemma
  - ✦ Coordinated creation of gas markets
  - ✦ Unclear authority
  - ✦ Enforcing take-or-pay contracts



# Preliminary Findings: Upstream

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- More gas than once thought
- LNG import progress; international pipeline development less certain
- Greater use of advanced technologies and management could yield great benefit
- Foreign investment could play much larger role with proper incentives

## Preliminary Findings: Midstream

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- West-East natural gas pipeline project is most significant effort to date
- Lack of infrastructure constrains market development
- Building skills to plan, operate, and maintain pipelines are critical
- Reforms can lower transport costs

# Preliminary Findings: Downstream

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- Creating market demand for gas is key challenge in future
- Greater enforcement of environmental regulations would raise demand and lower risk
- More R&D needed in key end-use technologies: turbines, fuel cells, gas-to-liquids

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## Preliminary Conclusions

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- China has demonstrated intent to boost gas use, but important hurdles remain
  - ✦ Greater overall coordination helpful
  - ✦ Rule-of-law and transparency
  - ✦ Reform and market orientation

# Preliminary Follow-on Suggestions

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- **Establish natural gas training center**
  - ✦ Focus on business planning, safety, operations and maintenance
- **Boost technology transfer**
  - ✦ Greater foreign investment is most likely and efficient mechanism
- **Assist in policy and regulatory development**
  - ✦ Could be part of U.S.-China Oil and Gas Industry Forum